BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 15-114

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AIR FORCE MATERIEL COMMAND
Supplement 1

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Weather

WEATHER SUPPORT EVALUATION

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFPD 15-1, *Atmospheric and Space Environmental Support.* It provides guidance and procedures for measuring and evaluating the operational effectiveness and technical performance of atmospheric and space environmental support, collectively termed weather support. It applies to all Air Force organizations which provide or receive weather support. Send comments and suggested improvements on AF Form 847, **Recommendation for Change of Publication**, through channels, to HQ AWS/XTA, 102 West Losey Street, Room 105, Scott AFB IL 62225-5206. Any organization may supplement this instruction. Major commands (MAJCOM), field operating agencies (FOA), and direct reporting units (DRU) send one copy of their supplement to HQ AWS/XTA and one to HQ USAF/XOWP, 1490 Air Force Pentagon, Washington DC 20330-1490.

(AFMC) This supplement implements AFPD 15-1, *Atmospheric and Space Environmental Support*, and AFI 15-114, *Weather Support Evaluation.* It expands on the guidance provided in the AFI 15-114, and applies to all AFMC organizations which provide or receive weather support. Use this with AFI 15-114, as supplemented. Units may further supplement this instruction and command supplement, as required. If supplemented, submit a copy to HQ AFMC/DOW, 4225 Logistics Ave, Ste 2, Wright-Patterson AFB OH 45433-5714.

SUMMARY OF REVISIONS

This revision aligns the instruction under AFPD 15-1. It restructures and incorporates requirements, information and procedures formerly contained in AFR 105-14, adds evaluation of operational effectiveness of weather support to military operations, and provides details on the reporting requirements levied in AFPD 15-1.

(AFMC) This supplement supersedes AFR 105-14/AFMC Sup 1 and provides updated terminology and instructions.

AFI 15-114, 19 January 1994, is supplemented as follows:

1. Evaluation Concepts:

1.1. Information on the past, present, and predicted states of the atmosphere and space environment, when effectively applied, enhances a commander's ability to envision the battle theater, determine when and where to apply specific weapon systems, and exploit combat opportunities. In this document, "weather" refers to both atmospheric weather and the conditions in the near-Earth space environment, and "weather support" refers to atmospheric and space environmental information provided by the Air Force weather support force. Effective evaluation of weather support to military operations depends on:

- A mutual understanding by warfighters and weather support providers of the effects of the atmosphere and space environment on military systems and on warfighter strategy, tactics, and operations.
- Identification of weather and space environmental criteria which are operationally significant to strategy, tactics, and operations.
- Measurement of how well weather support processes and products support warfighter systems, strategy, tactics, and operations.

1.2. Units will employ principles and statistical techniques of total quality to evaluate all facets of weather support. Evaluations will address technical performance, operational effectiveness of weather products and services, and wartime forecasting proficiency. Most measurements should be made at the work center level. These feedback measurements should have enough detail to drive improvement in how the work center meets their customers' needs. Higher organizational levels should receive information which is important to their organization's mission and may want to receive aggregated or rolled up results of work center performance. Using control charts and other total quality analysis techniques will allow each organizational level to identify when to investigate statistically significant changes in performance. Control charts are also an excellent way for work centers to provide feedback to each worker--a tool to ensure continuous improvement within a work center. Quality measurements, assessments, and investigations at each organizational level are key to improving weather support processes, removing non-value added processes, and demonstrating and proving return on investment for acquisition of new technologies, systems, training programs, etc.

1.3. (Added-AFMC) The AFMC Weather Technical Evaluation program is designed to track technical performance, operational effectiveness of support services and wartime forecasting proficiency of the command's field units. Program objectives are:

- To verify that weather field units have requisite technical skills to meet the weather support requirements of AFMC and other warfighting commands.
- To identify and implement initiatives to improve weather support if command-wide statistics reflect such a need.
- To respond to field requests--and arrange for technical assistance through HQ AWS/XT.

- To crossfeed pertinent Air Force-level and other MAJCOM technical health conclusions to AFMC weather field units.

1.3.1. (Added-AFMC) AFMC's measure of the quality of its field unit weather support will be represented by a technical health indicator (THI). The THI combines the command's average for technical performance (TP) and technical effectiveness (TE) into a single value. THI will be calculated by the following formula:

$$THI = 1/2 (TP + TE)$$

where TP and TE are computed as specified in paragraphs 2.3 and 3.2.1, respectively.

2. Technical Performance:

2.1. Observing and forecasting skills are the foundation for effective weather support to the warfighter. Weather support providers will evaluate their technical skills and products using manual or automated methods. Work centers should develop local methods for obtaining verification information on mission forecasts and use the revised automated terminal aerodrome forecast verification program (TAFVER II) to obtain information on locally prepared aerodrome forecasts. Refer to USAF Environmental Technical Applications Center (USAFETAC) instructions for details on using the TAFVER II program and its capabilities.

2.2. Work centers issuing weather warnings or advisories for tornadoes, hail, or winds will complete AF Form 3810, **Weather Warning and Weather Advisory Data.** Attachment 1 gives instructions and attachment 2 shows a sample form.

2.3. (Added-AFMC) TP is determined at HQ AFMC/DOW by measuring the accuracy of forecasts and weather warnings issued by the field units. The AFMC TP is the mean TP averaged over all occurrences at all AFMC weather field units. The indicator will be computed by the following formula:

$$TP = 1/2 [FPI + WWPI] \quad \text{where}$$

FPI = Forecast performance indicator (based on the percentage of TAFVER II forecast verifications for 6 and 24 hour ceiling/visibility forecasts).

WWPI = Weather warning performance indicator (based on the percentage of weather warnings verified and meeting the desired lead time (DLT)).

3. Operational Effectiveness:

3.1. Operational effectiveness is the ultimate goal of Air Force weather support. To evaluate operational effectiveness of weather support:

- Users of weather information and the weather support providers will determine together what weather information is important to the users' operations (e.g., low level, drop zone, air-refueling, precision bombing, satellite tracking, gridded weather data, etc.), and define specific thresholds for weather parameters (e.g., clouds, visibility, precipitation, winds, temperature, turbulence, icing, thunderstorms, energetic proton levels, etc.) which affect those operations.
- Users of weather information and the weather support providers together will develop effective metrics and feedback mechanisms.

- Users of weather information will provide timely feedback to their weather support providers on the effectiveness of the weather support.
- Weather support providers will evaluate the feedback, along with internally generated measurements.
- Units will develop and implement plans to continuously improve the effectiveness of weather support.

3.2. MAJCOMs, FOAs, and DRUs will determine a metric or metrics which indicate the effectiveness of weather support within their command and will develop measurement procedures commensurate with the metric or metrics. Metrics should capture what is most important to or has the most impact on operations within the command. The metrics could be determined from automated information or could be information (such as roll up charts) submitted by their field units. The metrics could be based on different weather phenomenon during different seasons of the year. Examples: One MAJCOM may want units to focus on individual sortie effectiveness and could modify its reporting software to facilitate reporting. At the MAJCOM level the focus could be on effectiveness to weapon platforms from a system perspective (see attachment 3). Another command may want base weather stations in winter to measure their effectiveness associated with early morning fog, drop zone winds, ceiling forecasts, and flight level winds. In summer, they may want the bases to measure effectiveness with severe thunderstorm outbreaks and pressure altitude forecasts for desert landing and takeoffs. What could be reported to the MAJCOM by each unit could be a consolidated roll up of each unit's measurements.

3.2.1. (Added-AFMC) Operational effectiveness is determined by HQ AFMC/DOW from TE statistics based on operationally significant, customer defined weather parameters. These parameters are used to formulate customer support goals (CSG). The weather field unit commander will meet with each operational customer to initially establish the CSGs and will update them as necessary based on customer input. (See attachment 1 for an example of a CSG.) The following formula is used in computing TE statistics:

TE = 1/2[(% CSG elements verified correctly) + (% CSG elements meeting DLTs)]

3.2.1.1. (Added-AFMC) Each CSG is grouped into one of three main forecast categories: winds, ceilings/visibilities, and thunder-storms/precipitation. A command-wide average based on the total number of occurrences is then calculated for each category for both verification and DLT. The three categories are then averaged together using each category's frequency of occurrence as a weight. The overall AFMC technical effectiveness measure, TE, is the simple average of the % CSG verified and the % CSG meeting the DLT.

4. Wartime Forecasting Proficiency:

4.1. Units will evaluate wartime forecasting skills using limited weather data, tactical weather systems, and military weather products. This can be accomplished as part of a base-wide exercise, a MAJCOM, FOA, or DRU- organized exercise or competition, or a real-world operation.

4.1. (AFMC) HQ AFMC/DOW will hold periodic wartime forecast exercises for the command. Field units will use the Air Force Dial-In System (AFDIS), if available. The MAJCOM DOW will evaluate the results and provide feedback to the units. When possible, field units are encouraged to evaluate their wartime skills during base-wide exercises and exercise deployments.

4.2. MAJCOMs, FOAs, and DRUs will coordinate exercise or competition plans and weather data requirements with Air Weather Service (AWS), as required.

4.2. (AFMC) Field units will coordinate with HQ AFMC/DOW for any nonroutine data requirements needed for locally developed wartime forecast exercises.

5. Reporting Procedures for RCS:HAF-XOW(M)9202 (Weather Support Evaluation Report). Continue reporting during emergency conditions using normal precedence.

5.1. Units will send to their parent MAJCOM, FOA, or DRU, by the 15th of each month, the preceding month's AF Form 3810, if applicable, and operational effectiveness information, as directed by their parent MAJCOM, FOA, or DRU.

5.1. (AFMC) By the 15th of each month, field units will submit their AF Form 3810, *Weather Warning and Weather Advisory Data*, statistics as well as CSG data to HQ AFMC/DOW.

5.2. MAJCOMs, FOAs, and DRUs will send a representative operational effectiveness metric for their command and received AF Forms 3810 to Headquarters Air Weather Service, Directorate of Technology (HQ AWS/XT); 102 W. Losey St., Room 105; Scott AFB IL 62225-5206 by the 25th of the month following the end of each season.

5.2. (AFMC) HQ AFMC/DOW will forward their TE statistics to HQ AWS/XT on a quarterly basis. This data should be sent by the 25th of the month following the end of each season.

5.2.1. Seasons are defined as follows: winter: December through February; spring: March through May; summer: June through August; fall: September through November.

5.3. Quarterly, HQ AWS will analyze the technical performance of the weather support force and consolidate received operational effectiveness information from the MAJCOMs, FOAs, and DRUs into the Air Force operational effectiveness metric. HQ AWS will provide the results to MAJCOMs, FOAs, and DRUs within 60 days after the end of the seasonal quarter.

5.3.1. HQ AWS will accept direct calls from all weather personnel regarding AF Form 3810, TAFVER II, or other technical issues.

5.4. Semiannually, by 31 January and 31 July, HQ AWS will forward the Air Force operational effectiveness metric and technical performance analysis covering the previous two quarters to HQ USAF/XOW.

6. Form Prescribed. Units which issue weather warnings or advisories will use AF Form 3810, **Weather Warning and Weather Advisory Data.**

7. Abbreviations and Acronyms Explained:

AFGWC--Air Force Global Weather Central

AFSFC--Air Force Space Forecast Center

AR--Air Refueling

AWS--Air Weather Service

DLT--Desired Lead Time

DRU--Direct Reporting Unit

DZ--Drop Zone

EOTDA--Electro-Optical Tactical Decision Aid

FAARP--Forward Area Arming Refueling Point

FOA--Field Operating Agency

MAJCOM--Major Command

T/O--Takeoff

USAFETAC--USAF Environmental Technical Applications Center

BUSTER C. GLOSSON, Lt General, USAF
DCS/Plans and Operations

Attachment 1

INSTRUCTIONS FOR COMPLETING AF FORM 3810 OR COMPUTER GENERATED FORM

A1.1. General Instructions . Units may submit AF Form 3810 or a computer generated form provided the computer product looks like a photocopy image of the existing form and the software name and vendor/producer are placed at the bottom of the face page. For example, the form identification could be "AF FORM 3810, MAR 92 (EF-V1) (Perform Pro)."

A1.2. Instructions for Completing AF Form 3810 or Computer Generated Form. Report technical performance data for locally required weather warnings and weather advisories for tornadoes, hail, and/or winds when verification data is available. Limited duty stations will report the data when they have an opportunity to achieve the desired lead time.

A1.2.1. Unit/MAJCOM, FOA, or DRU: Self-explanatory.

A1.2.2. Location: Self-explanatory.

A1.2.3. Period: Month and Year of data.

A1.2.4. Column A, Criteria: List locally required warning or advisory criteria for tornadoes, hail, and/or winds. Differentiate each wind criteria into two line entries, one marked "convective" and the other marked "non-convective." For example: You are required to issue a local warning for winds greater than or equal to 40 knots. If during a month you issue two warnings, one due to a strong winter front and the other due to a thunderstorm, then enter the verification information of the first warning on the line marked "non-convective winds greater than or equal to 40 knots" and the second warning on the line marked "convective winds greater than or equal to 40 knots." Even though your customer may not need to differentiate between the cause of the wind occurrence, the Air Force needs the information to evaluate the effect new systems, techniques, or training programs have on Air Force weather support abilities.

A1.2.5. Column B, Desired Lead Time (DLT): List in minutes (e.g., 060, 120, etc.) the notification lead time required by the customer.

A1.2.6. Column C. Required: The number required is the sum of the following:

- Number issued for which the event occurred.
- Number of occurrences when a warning or advisory was not issued but was required.

A1.2.7. Column D, Issued: Enter the number of warnings or advisories issued for each criterion. If the warning or advisory text contained more than one criterion (such as convective wind greater than or equal to 50 knots and hail), count each separately.

A1.2.8. Column E, Met DLT: Enter the number of required warnings or advisories that meet the DLT.

A1.2.9. Column F, LT>0: Enter the number of warnings or advisories with actual lead times that are greater than zero.

A1.2.10. Column G, False Alarm: Enter the number of warnings or advisories issued but were not required.

A1.2.11. Column H, Required, Not Issued: Enter the number of times the criterion occurred but a locally required warning or advisory was not issued.

A1.2.12. Columns I through R, Actual Lead Time: Enter the number of warnings or advisories that verified corresponding to the appropriate lead time increment.

[***NOTE:*** Until AF Form 3810, May 92 is depleted, annotate the legend for columns J through R with the following: J= 1-9, K= 10-19, L= 20-29, M= 30-39, N= 40-49, O= 50-59, P= 60-89, Q= 90-119, R > 120.]

A1.2.13. Remarks: Enter any pertinent remarks, such as, degree of miss on false alarms, etc.

Attachment 2

SAMPLE OF A COMPLETED AF FORM 3810

WEATHER WARNING AND WEATHER ADVISORY DATA

UNIT/MAJCOM: 123 OSS/OSW | LOCATION: XYZ AFB | PERIOD: JUL 93

	NOMENCLATURE							ACTUAL LEAD TIME										
CRITERIA A	DESIRED LEAD TIME B	REQUIR-ED C	ISSUED D	MET DLT E	LT > o F	FALSE ALARM G	RQRD NOT ISSUED H	NEG O I	1-10 J	11-20 K	21-30 L	31-40 M	41-50 N	51-60 O	61-90 P	91-120 Q	> 120 R
TORNADO	030 min																
WINDS (CONV)> = 40 knots	030 min	4	19	4	4	15							1		1	2	
WINDS (NON-CONV) > = 40 knots	030 min	1	0	0													
HAIL > = 3/4 inch	030 min	8	14	5	8	6			1	1	1	1		1	2		1
TOTAL		13	33	9	12	21			1	1	1	1	1	1	3	2	1

REMARKS:

AF FORM 3810, MAR 92 (EF-V1) (PerFORM PRO)

Attachment 3

MEASUREMENT PROCESS EXAMPLE

A3.1. One way to look at weather support effectiveness and be able to "peel back the onion" would be to have units concentrate on the individual sortie effectiveness and MAJCOMs look at the weather support effectiveness to weapon system types. Figure 1 graphically shows a possible relationship of sortie weather support effectiveness measurements at different levels in the Air Force. The unit could acquire feedback on sortie operation weather thresholds by using a debriefing format (see figure 2) which would be turned in by returning pilots during their normal debriefing. MAJCOMs could modify existing sortie effectiveness assessment software to include information on weather support effectiveness, distinguishing it from "weather" (i.e. Mother Nature). For example, USAFE's Daily Operations/Maintenance Summary could be modified to add the following information: The number of sorties not successful due to weather, but the weather was as briefed.

Figure A3.1. Sample Weather Support Effectiveness Structure.

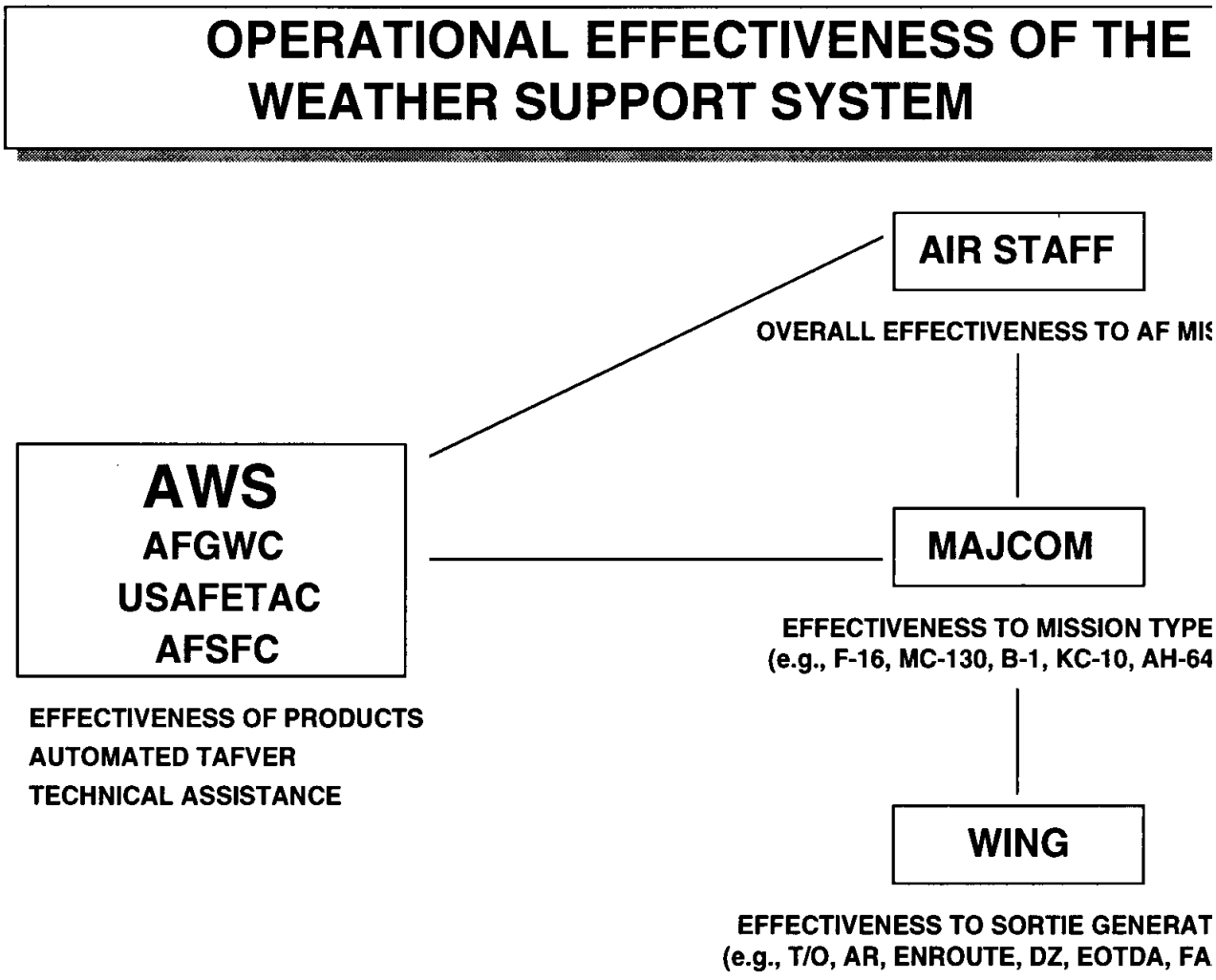

Figure A3. 2. Sample Debriefing Format.

WEATHER SUPPORT EFFECTIVENESS

MISSION

(Circle applicable types)

AR BOMBING DZ/LZ INTERDICTION LOW-LVL OTHER RECON

FORECAST RATING

1. Mark a space along the scale for each weather element to indicate the degree of representativeness of your mission forecast.

---- Left end of the scale indicates an unrepresentative or mostly unrepresentative forecast.

---- Right end of the scale indicates a representative or mostly representative forecast.

2. For **multiple mission types**, please **mark the scale using the first letter of the mission type** to which you are providing feedback

UNREPRESENTATIVE **REPRESENTATIVE**

CLDS/VIS/PRECIP ___ ___ ___ ___ ___ ___ ___

WIND ___ ___ ___ ___ ___ ___ ___

TURBULENCE ___ ___ ___ ___ ___ ___ ___

ICING ___ ___ ___ ___ ___ ___ ___

THUNDERSTORMS ___ ___ ___ ___ ___ ___

OTHER ___ ___ ___ ___ ___ ___ ___

OVERALL FORECAST ___ ___ ___ ___ ___ ___

COMENTS:_____

_____

_____

_____

Attachment 4 (Added-AFMC)

CSG EXAMPLE

The following is an example of a CSG for ceiling/visibility:

"Seventy percent of the time correctly forecast instrument flight rule (IFR) conditions (less than 1000 feet/2 miles) on the 0800Z and 2000Z forecasts. During the first six hours of each forecast, the forecaster must be within plus or minus one hour of forecasting the onset of IFR conditions."

Rationale for the CSG:

1. Daily flight training activities are based on 0800Z and 2000Z forecasts.

2. IFR conditions cause aircraft without an instrument landing system (ILS) capability to divert to another airfield.

3. Air Force operations planners will accept a one hour timing accuracy--this will enable them to adjust actions of mission support resources to meet changing weather conditions.

4. "Seventy percent" accounts for infrequency of IFR conditions and rapidly moving weather systems.